Wax
21715

ARPA Network Information Center
Stanford Research Institute

Collins Radio Company

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Packet Radio Temporary Note # 88

NIC # 21715

PROPOSED SYSTEM FEATURES AND EQUIPMENT DESIGN PLAN OUTLINE

1.0 INTRODUCTION

The development of a Preliminary Specification and Equipment Design Plan must be preceeded by the selection of a set of desired network/system characteristics and parameters. This note identifies a partial set of key system and equipment features and presents an outline of the equipment design plan that will be developed in accordance with these proposed choices.

The list of features is not complete, but it is limited to those critical items that have the greatest impact on the design of the RF and signal processing portions of the prototype equipments. It is assumed that the desired logical requirements of the system (routing, flow control, etc.) can be satisfied by the computing power planned for the equipments.

The proposed system features provide an ambitious goal for the prototype development efforts, ensure several degrees of freedom for channel and network experiments, and are open-ended in the sense that more sophisticated techniques (for example, multiple channels or frequency hopping) can be added as the network evolves.

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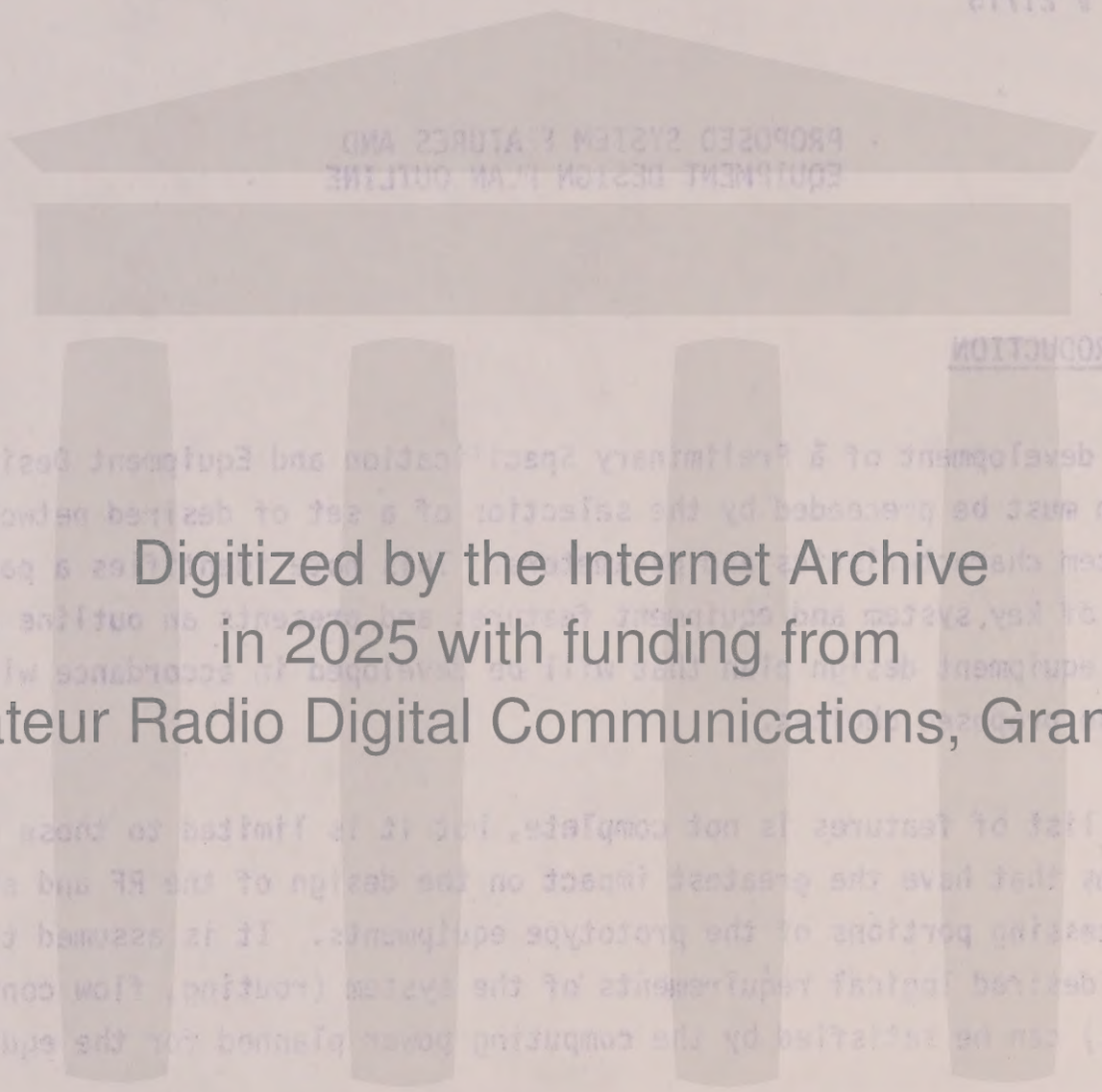

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Sections 2.0 and 3.0 list particular network/system parameters proposed for the initial network and key equipment performance factors, respectively. Section 4.0 is the outline for the Equipment Design Plan.

It is recommended that the proposed network/equipment features be adopted for the Preliminary Specification. The Equipment Plan is being prepared in accordance with this outline and the proposed features. The target for the completion of this plan is the end of February. Additions and/or changes to the network/system parameters must be made quickly so that the Preliminary Specification, including the Equipment Plan, can be prepared.

2.0 NETWORK/SYSTEM PARAMETERS

A. Carrier frequency between 1 GHz and 2 GHz. Target frequency band is 1710 to 1850 MHz.

B. A single common channel for all network traffic. The center frequency of this common channel is selectable on defined increments within the assigned band.

C. Capability for both non-slotted Aloha and carrier sense access disciplines.

D. Dual data rate: R_1 KB/S for terminal-repeater links and nR_1 KB/S for repeater-repeater links.

E. Transmit power level control.

3.0 KEY EQUIPMENT PERFORMANCE FACTORS

A. The signal structure is differential coherent minimum shift keying (D.C.M.S.K.) with code spread of between 100 and 200.

B. Signal processing designed for the capability of multiple detectors (may not be implemented on initial units).

C. Omni directional antenna with gain of 9 dbi for repeater.

D. Packet format is á fixed length header and variable length text with maximum length of 2048 bits.

E. The digital unit has an addressing structure capable of a total of 4K words of memory.

4.0 EQUIPMENT DESIGN PLAN OUTLINE

1.0 INTRODUCTION

1). Purpose of This Document

- Identify and describe the equipments planned for use in the initial system experiments.
- Provide direction for the development effort.
- Provide projected performance parameter to be used in network models and evaluations.

2). Mission of Prototype Equipments

- Provide a capability for testing and verification of the basic network and channel design models.
- Provide a flexible vehicle for investigating promising network/system design options.

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- Provide a flexible vehicle for investigating promising network/system design options.

3). Design Guidelines

- The initial prototype equipments are the first step in the evolution of a packet switched network for interactive data terminals.
- The prototype equipments will be organized and constructed as a set of functional modules. This is to facilitate the modification and/or change of specific functions as the system design matures.
- The initial equipments will be as compact as is possible using available components and construction techniques.
- The units will be capable of being battery powered.

4). Summary of Design Characteristics

2.0 FUNCTIONAL DEFINITION

1). Functional Identification - Figure 2.1

Prototype Station
Prototype Repeater
Prototype Terminal

2). Functional Description

Brief functional definition of each element: Repeater, Station and Terminal.

3). Interface Definition

1. RF/Channel Interface
2. Modem/PKG/Digital Interface
3. Station Processor Interface
4. Terminal I/O Device Interface

Identify and define each primary or controlled interface

- Electrical Parameters: V, Z, F, BW, etc.
- Physical Parameters: Max Distance, etc.
- Operational Parameters: FDX, HDX, Timing, Control Protocols, etc.

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3.0 RADIO PLAN

1). General Description - Figure 3.1

- Expanded Functional Diagram
  Ant, Power Amp, Modulator/Encoder,
  Up/Down Converters, Freq. Gen., Sync/Data
  Detection, Control and Monitor

- Brief Operational Description

- Performance Specification Summary

2). Design Details (by function)

1. Ant
2. Power Amplifier
3. Frequency Generation
4. Modulator/Encoder
5. Up/Down Converters
6. Sync/Data Detection
7. Control, Monitor and Interface Logic

Each design detail section will include:

a) Functional Schematic Diagram
b) Identification and Definition of Interfaces
c) Project Design and Performance Data, Curves, etc.
d) Packaging Data - Form Factor, PCB or Module
   Construction, Layout Sketches
e) Power and Monitor Provisions
f) Power Estimate: Voltage, Current, Duty Cycle
g) Design Differences Between Repeater, Terminal, Station
   Applications

4.0 DIGITAL PLAN

1). General Description - Figure 4.1

- Expanded Functional Diagram
  by Function (Packet Interface Logic, CPN, Memory
  and I/O's) and by Application (Repeater, Terminal, Station)

- Brief Operational Description

- Design Specification Summary (by Application)

3.0 RADIO PLAN

1). General Description - Figure 3.1

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  Ant., Power Amp., Modulator/Encoder,
  Up/Down Converters, Freq. Gen., Sync/Data
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4.0 DIGITAL PLAN

1). General Description - Figure 4.1

- Expanded Functional Diagram
  by Function (Packet Interface Logic, CPU, Memory
  and I/O's) and by Application (Repeater, Terminal, Station)

- Brief Operational Description

- Design Specification Summary (by Application)

2). Design Details (by Function Organ)

1. Modem Interface Logic
2. CPU
3. Memory
4. DMA Control
5. I/O Channel(s)
6. Software Organization

This section organization and contents per same guidelines as 3.2.

5.0 COMSEC PLAN

6.0 PROTOTYPE REPEATER CONFIGURATION

1). Capability Summary: STD and Options

2). Composite Diagram

3). Power Sources and Distribution

Power Consumption Summary
Prime Power Alternatives
Design Data

4). Physical Description

Layout, Form Factors, Chassis
Enclosure
Size, Weight, Thermal Conditions

5). Maintenance and Self-Check

7.0 PROTOTYPE TERMINAL CONFIGURATION

(Same as 6.0, but RF and Modem only).

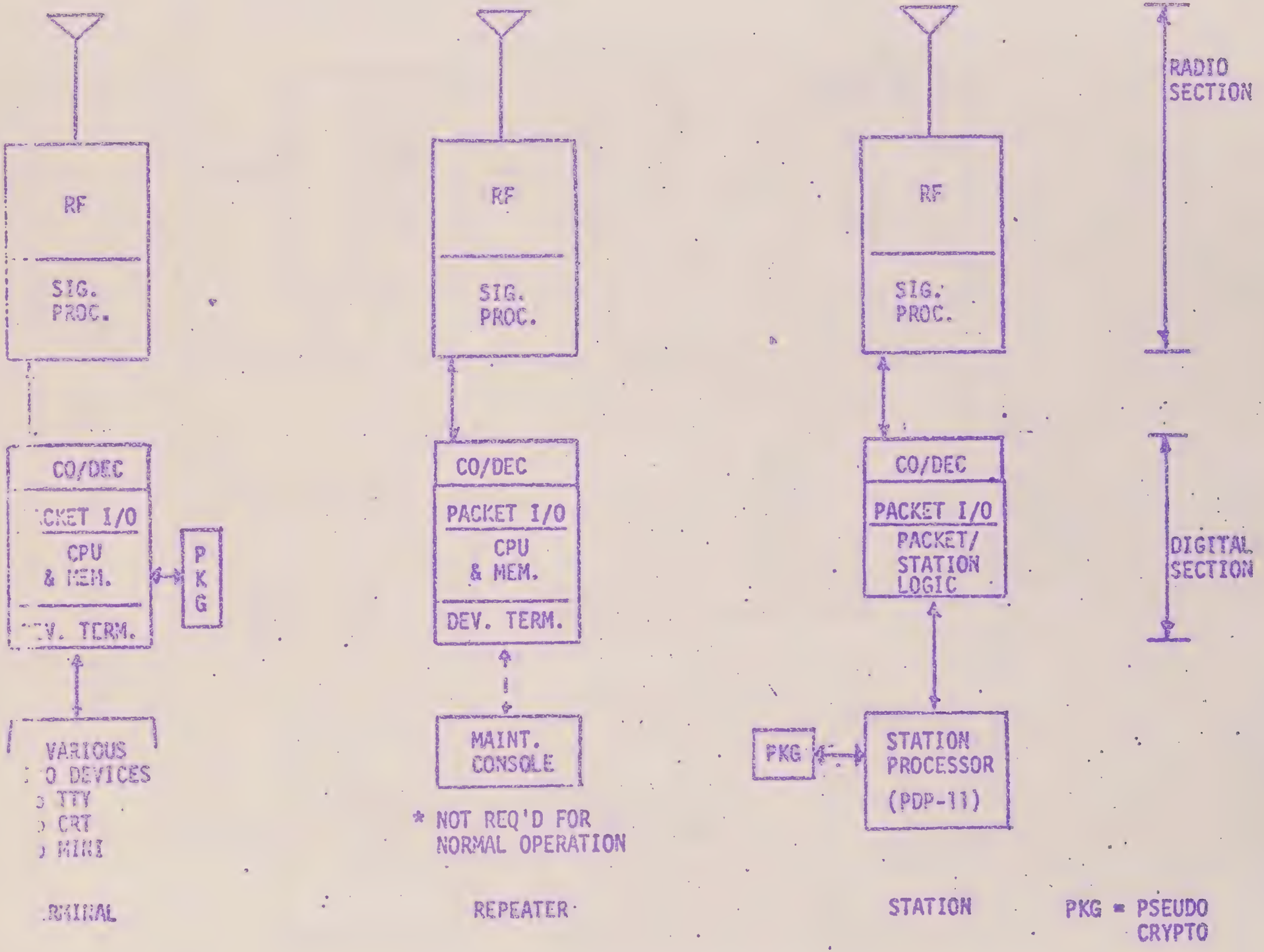
8.0 PROTOTYPE STATION CONFIGURATION

ANNEXES

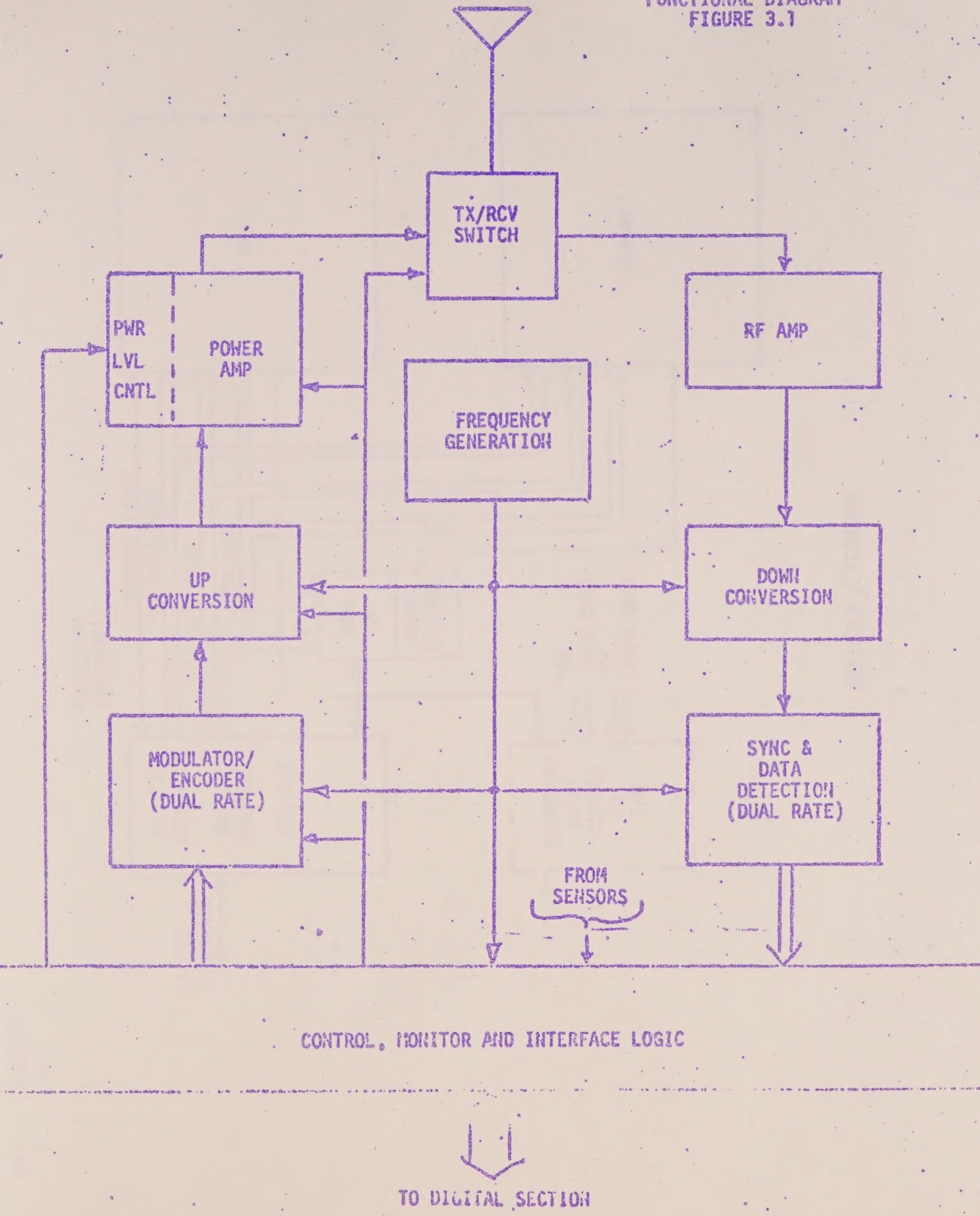
The Annex section of the Equipment Design Plan will contain documentation covering the analysis, evaluation and trade-off investigations that were used to derive the proposed design approach. Specific subjects include:

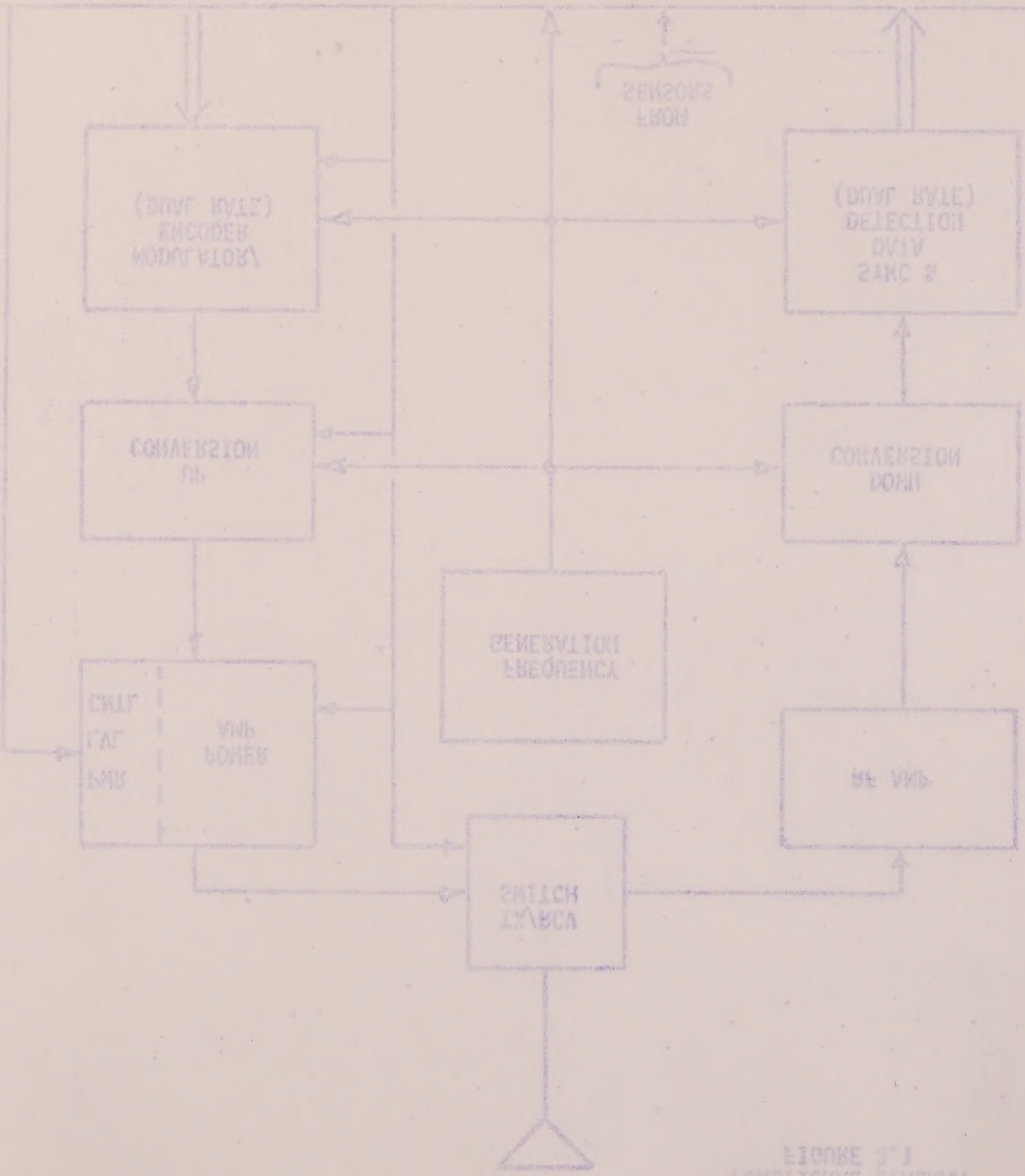
1. Modulation/Detection
2. Sync/Preamble
3. SAWD Technology
4. Impact of Channel Options
5. Propagation Power Budget Analysis
6. Prime Power Considerations
7. Power Distribution Options
8. Code Selection
9. Microprocessor Components

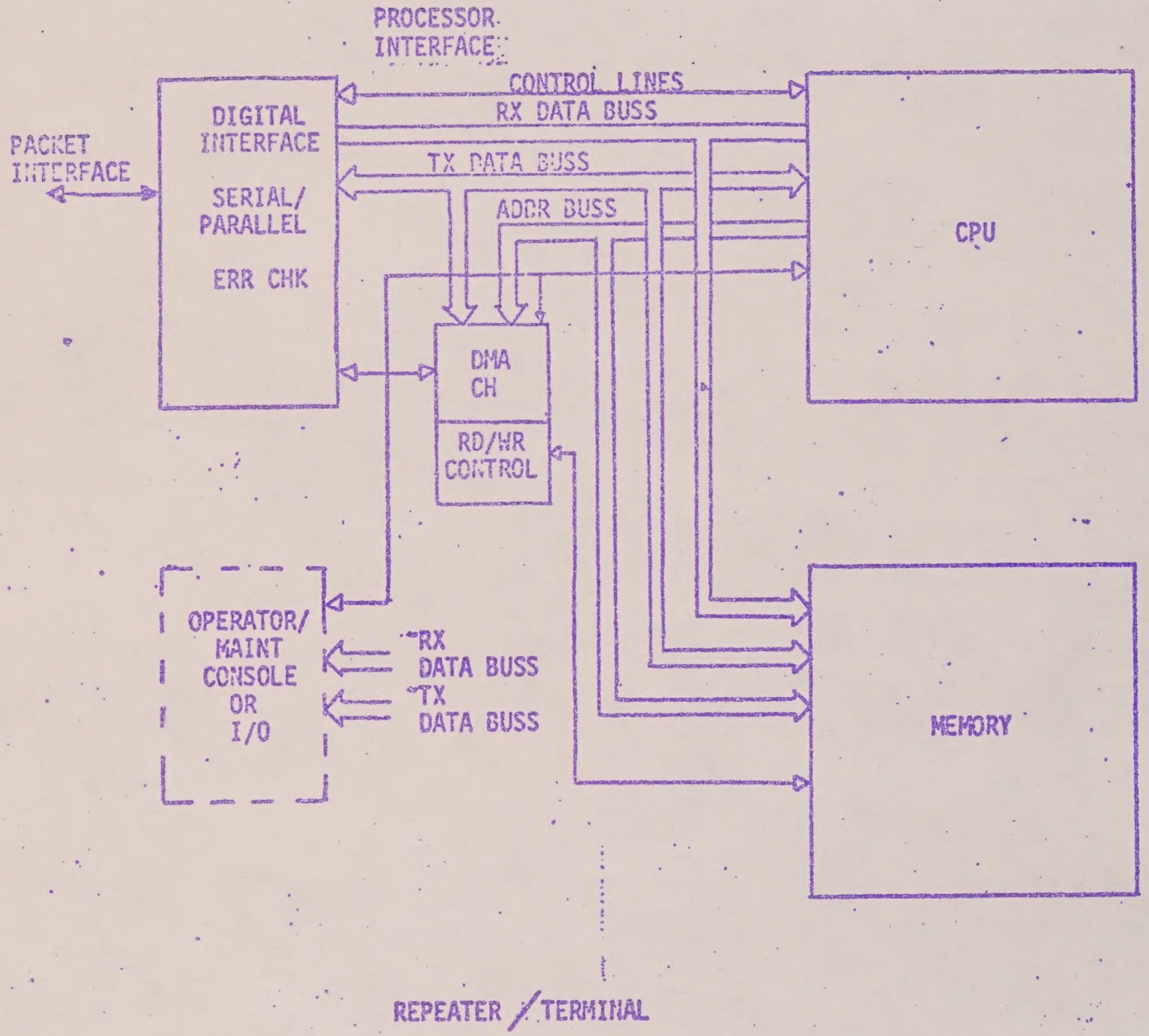
FUNCTIONAL DIAGRAM - PROTOTYPE EQUIPMENTS
Figure 2.1



RADIO SECTION
FUNCTIONAL DIAGRAM
FIGURE 3.1






PROCESSOR INTERFACE
CONTROL LINES
RX DATA BUSS
TX DATA BUSS
ADDR BUSS
PACKET INTERFACE
DIGITAL INTERFACE
SERIAL/ PARALLEL
ERR CHK
CPU
DMA CH
RD/WR CONTROL
OPERATOR/ MAINT CONSOLE OR I/O
RX DATA BUSS
TX DATA BUSS
MEMORY
REPEATER / TERMINAL

MEMORY
CPU
PROCESSOR INTERFACE
CONTROL LINES
RX DATA BUS
TX DATA BUS
DIGITAL SERIAL PERIPHERAL INTERFACE
ERR SYNC
PACKET INTERFACE
DMA CH
DMA BOARD CONTROL
TX DMA BUS
RX DMA BUS
MODEM/ TRANSMIT/ RECEIVE